Tropentag 2007
University of Kassel-Witzenhausen and
University of Göttingen, October 9-11, 2007

Conference on International Agricultural Research for Development

Traditional, neglected vegetables of Nepal: Their sustainable utilization for meeting human needs

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Introduction

Nepal is situated on the southern slopes of the central Himalayas and occupies a total area of 147,181 km^2, corresponding to about 40% of the area of Germany. Nepal's great biodiversity is associated with the country's exceptional diversity of topographic, climatic, and agro-ecological conditions. According to these conditions, Nepal is divided into four main physiographic zones (MFSC/GEF/UNDP, 2002), High Himal (above 5,000 m asl.); High Mountains (3,000-5,000 m asl.) with alpine or subalpine climate; Mid-Hills (1,000-3,000 m asl.) with temperate or subtropical climate, and Lowlands (below 1,000 m asl.) with tropical climate. In Nepal, between 5,800 (HARA AND WILLIAMS, 1979; HARA ET AL., 1978, 1982) and 6,500 species of flowering plants (WCMC, 1994) have been estimated, about 1,500 of which are considered useful (MANANDHAR, 2002). Out of these, 651 species are economically useful including 440 species of wild food plants. About 200 plant species are consumed as vegetables (MANANDHAR, 2002), most of them, however, are regarded underutilized or neglected.

Cultivating and gathering indigenous vegetables for both self-consumption and sale are still very common in Nepal, particularly in remote areas. During food scarcity periods, people from urban and rural communities heavily depend on gathering these vegetables from their natural habitats (MANANDHAR, 1982). The potential of traditional vegetables may help to meet the increasing demands of the growing population, for which Nepal must double its food production in the next 20 years. Increased use of traditional vegetables can contribute to enhance people's health and standard of living as well as the economic and social status of the food producers themselves.

Genetic resources of many traditional vegetables are threatened by genetic erosion. This is mainly due to the (i) expansion of mechanized, intensive agriculture in Nepal; (ii) introduction of exotic vegetable species and improved varieties; (iii) loss and degradation of agricultural and forest land (e.g., caused by infrastructure development, soil erosion, and logging of forests to fulfill the demands of the growing population); (iv) over-exploiting of wild plants (e.g., for food, fuel, or fodder); and (v) poor marketing opportunities for traditional vegetables (MANANDHAR, 1989).

Besides gathering vegetables from the wild, their cultivation in homegardens plays an important role towards household food and nutritional security. In Nepal, homegardens are well established, relatively small agroecosystems within larger farming systems, maintained around or very close to the homestead (SHRESTHA ET AL., 2004). However, research on Nepalese homegardens is still in its beginning, particularly in the context of plant genetic resources conservation. In other parts of the world, many studies on homegardens have revealed that they are highly dynamic, species-rich systems that mimic the multi-layered vegetation structure of natural ecosystems (GESSLER ET AL. 1998; KEHLENBECK AND MAASS, 2006). Homegardens not only provide food, fodder, fuel,

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medicines, spices, construction material and income, but they are living genebanks and a reservoir of plant genetic resources that preserve landraces, cultivars, rare and endangered species as well as species neglected in large-scale agroecosystems (EYZAGUIRRE AND LINARES, 2001). Therefore, homegardens are regarded important for *in situ* conservation of a wide range of plant genetic resources (EYZAGUIRRE AND WATSON, 2002).

In Nepal, efforts to collect and utilize the largely eroding genetic resources of traditional vegetable species have only incipiently started, resulting in a lack of in-depth knowledge. Therefore, this study aimed at contributing to the limited knowledge about traditional vegetables in Nepal by documenting their occurrence and utilization. In addition, their conservation status was assessed.

Materials and Methods

Study sites in five districts of Central and Eastern Nepal (Figure 1) were selected in order to cover the three physiographic zones Lowland, Mid-Hills, and High Mountains (Table 1). Three to five locations per district were chosen and assigned to different levels of urbanization (urban, peri-urban, rural).

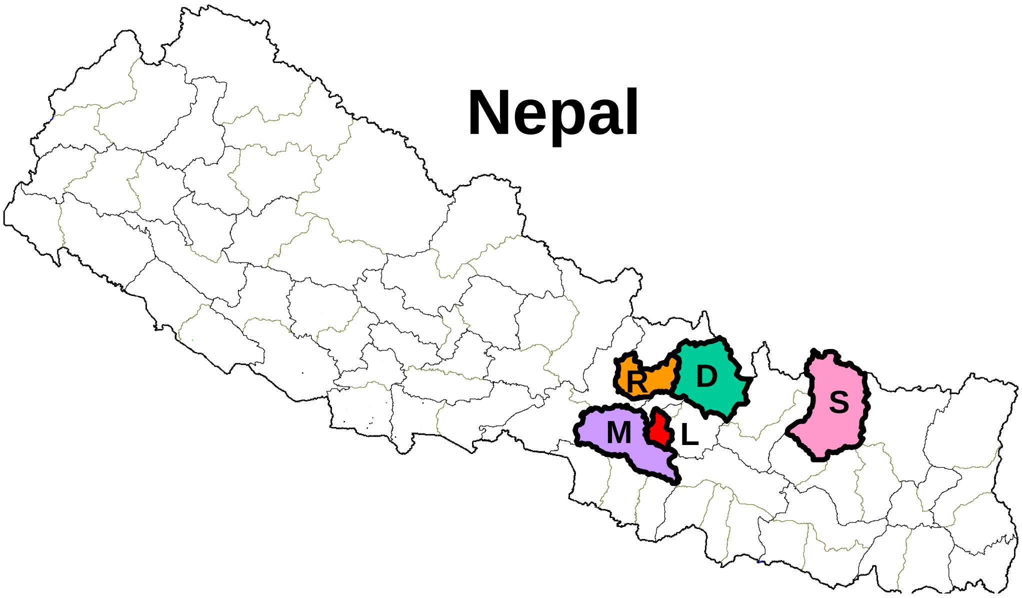


Figure 1: Research area in Nepal (for district abbreviations see Table 1).

The districts Rasuwa, Solukhumbu, Makawanpur, and Dolakha were visited once in the years 2001, 2004, 2005, and 2006, respectively, whereas Lalitpur three times in 2005. During these field visits, complete lists of traditional vegetable species were compiled for every location, including site names and altitude (see Appendix). In this study, traditional vegetables are defined as "indigenous or exotic species which, due to long use, have become part of the culture of a community" (KELLER ET AL., 2005). Traditional vegetable species were recorded and specimens collected from natural and semi-natural habitats (referring to forest, shrub land, fallow land, and agriculture field margins) as well as from homegardens, farmers' fields, and markets. Information about local names, utilization, market value, and seasonal availability was mainly gathered during interviews of elderly farmers and vegetable sellers (especially women), and of local communities by using an unstructured questionnaire. Additional information was gathered by personal observations, market surveys, and literature review. Herbarium specimens were identified and preserved in the National Herbarium and Plant Laboratories (*Index herbariorum* KATH), Department of Plant Resources, Kathmandu, Nepal.

Table 1. Research locations in five districts of Central and Eastern Nepal.

District (abbreviation)	Location	Altitude (m asl.)	Physiographic zone	Level of urbanization
Dolakha (D)	Charikot	1800	Mid-Hills	Peri-urban
	Kuri	3200	High Mountains	Rural
	Kalinchok	3900	“	Rural
Lalitpur (L)	Bhisankhu	1400	Mid-Hills	Rural
	Godawari	1500	“	Peri-urban
	Patan	1300	“	Urban
	Phulchoki	1800-2000	“	Rural
Makawanpur (M)	Manohari	200	Lowlands	Rural
	Hetauda	500	“	Urban
	Palung	1800	Mid-Hills	Rural
	Daman	2300	“	Rural
Rasuwa (R)	Chandanbari	1800	Mid-Hills	Rural
	Dhunche	2100	“	Rural
	Langtang	2500-3600	High Mountains	Rural
	Above Gosainkunda	4200	“	Rural
Solukhumbu (S)	Ghat	2500	Mid-Hills	Rural
	Munjo	2800	“	Rural
	Namche	3400	High Mountains	Rural
	Debuche	3600	“	Rural

Results and Discussion

Diversity of traditional vegetables

A total of 184 traditional, neglected vegetable species was recorded in the field survey (Table 2; Appendix). Out of these, 98 species were mainly used for their leaves, 34 for tender shoots, 12 for flowers, 3 for stems, 22 for fruits, and 15 for roots and tubers. About 80% of the species were collected from natural or semi-natural vegetation, particularly forest. Only 41 traditional vegetables were cultivated, 32 in homegardens and 9 in farmers’ fields (Table 2). All species cultivated in fields and eight of those grown in homegardens were frequently sold at markets.

Species composition and richness differed according to level of urbanization. The highest number of collected traditional vegetable species was recorded in the rural locations (Table 2). However, also in the urban and peri-urban locations a high number of vegetable species was collected from the wild. In urban areas, most of the collected species were gathered from fallows, whereas from forests in the rural and peri-urban ones. Concerning cultivated traditional vegetables, high numbers were found in urban and peri-urban homegardens and fields. This may be due to the proximity of easily accessible markets in and around the capital, Kathmandu.

In the rural localities, only few traditional vegetables were cultivated (Table 2). This was apparently caused by the rural farmers’ preferences for growing exotic vegetables (e.g., cabbages, radish, potatoes, tomatoes) that obtain higher prices as compared to traditional vegetables and are more easily transported to the distant urban markets. Instead of cultivating traditional vegetables for their daily consumption, rural farmers prefer to collect them from the natural vegetation.

In the market surveys, a total of 50 traditional vegetable species was documented (Table 2) with the highest species number at urban markets. At rural markets, only few traditional vegetables were sold. These markets were dominated by exotic vegetables, reflecting the situation of cultivated vegetables in homegardens and fields of this area. In conclusion, traditional vegetables gathered from natural vegetation played an important role for the nutritional security of rural Nepalese households, whereas in peri-urban and urban areas both wild and cultivated vegetables contributed to subsistence and cash income generation.

Table 2. Number of traditional vegetable species recorded in five Nepalese districts.

	Rural locations (N=15)	Peri-urban locations (N=2)	Urban locations (N=2)	No location recorded	Total sum
Collected in forests	42	22	12		76
Collected in fallows	19	9	24		52
Collected in shrub lands and field margins	8	5	3		16
Cultivated in homegardens	3	12	17		32
Cultivated in fields	1	2	6		9
Sold in markets	8	11	31		50
Total	70	46	64	4	184

Note: Total no. of species is not equal to the sum of the respective column due to double-counting.

Indigenous knowledge and cultural value

Rural women are often the major players in utilizing wild traditional food plants including vegetables. They hold and maintain the knowledge about gathering locations and seasons, preservation, processing, and culinary uses of such plants. Women were also involved in cultivating and trading traditional vegetables, strengthening most likely their economic status within the families. Some traditional vegetables have a high cultural value in Nepal. Their use is part of the cultural heritage, playing an important role in maintaining customs and traditions. For example, certain *Dioscorea* species are very important for celebrating the religious Hindu festival of ‘Maghe Sankranti’, starting on the first day of the Nepali month of ‘Magh’ (January). On this day, tubers of *Dioscorea* species are boiled, fried, and eaten, causing a high market demand. Respondents reported that mostly rural men collected these tubers from natural vegetation and sold them in urban and peri-urban markets. The main season for collecting traditional vegetables was said to be from May to July (see Appendix). For self-consumption as well as sale in the dry season (February to April), some traditional vegetables like *Dendrocalamus* spp. shoots and certain leafy vegetables were preserved. Both wild and cultivated traditional vegetables were said to play an important role as emergency food during times of scarcity.

Loss of traditional vegetable diversity

Despite their importance for subsistence, income generation, and culture, the use of traditional vegetables is declining at an alarming rate in all areas of Nepal, combined with genetic and cultural erosion (pers. obs.). This occurs particularly in easily accessible regions, where commercialisation of the production is possible. Only few traditional vegetables such as *Fagopyrum esculentum, F. tartaricum, Amaranthus caudatus*, and *A. lividus* were still cultivated at field-scale in the districts surveyed (see Appendix) due to their high market value. Cultivation of exotic vegetables for subsistence and sale increases more and more at the expense of traditional ones, partly promoted by development programmes (SHRESTHA ET AL., 2004). These projects mostly did not consider the disadvantages of exotic vegetables, e.g., the high need of external inputs for successful cultivation or the often rather low nutritional value. However, many Nepalese farmers including those of the districts surveyed already prefer to grow exotic vegetables due to their high market demand.

According to the respondents, the availability of wild traditional vegetables has also declined drastically, e.g., because of land-use and habitat change, excessive collection from natural habitats, climate change causing more frequent droughts and fires, and deforestation. In the research area, species such as *Dryopteris cochleata, Polygonum molle, Asparagus racemosus,* and *Rheum australe* were considered to be endangered because they have a high demand at markets, but are mostly (and often excessively) gathered from their natural habitats. For many wild species, rural farmers depend on volunteer plants for gathering during the rainy season

instead of making deliberate efforts to cultivate them permanently as vegetables in their fields or homegardens. The disappearance of traditional vegetables in some areas may also be a consequence of the introduction of improved agricultural techniques, in which many traditional vegetables are treated as weeds.

Conclusions and Recommendations

Vegetables are a significant component of the Nepalese diet, and traditional ones are still important, although they have mostly been neglected in research and development. To avoid or at least minimize the impending genetic and cultural erosion concerning traditional and neglected vegetables, their germplasm should intensively be collected and conserved on-farm as well as in genebanks. The related indigenous knowledge urgently needs to be documented for serving future generations. The cultivation methods of these vegetables, for example in homegardens, should be studied and improved. Their nutritional value needs to be analyzed and recognized. In addition, their utilization should be promoted to improve livelihoods in rural and urban Nepal.

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Appendix: List of traditional vegetables recorded in five districts of Nepal, including scientific and local species name, morphology and used part of the species, district (=Di., for abbr. see Table 1) and location of collection site, its altitude (m asl.) and urbanization level (=Urb.lev.; U=Urban; P=Peri-urban, R=Rural), type of natural vegetation or agro-ecosystem where the species was recorded, its market and its seasonal availability.

	Scientific plant name	Family	Local name	Morpho-logy	Used plant part	Collection site Di.	Location	Alti-tude	Urb. lev.	Type nat. vegetation	Type agro-ecosystem	Market availability	Season of availability
1	*Abelmoschus manihot*	Malvaceae	Ban nalu	Herb	Fruit	M	Hetauda	500	U		U homeg.		May-Jun.
2	*Abelmoschus moschatus*	Malvaceae	Lata kasturi	Herb	Fruit	M	Hetauda	500	U		U homeg.		May-Jun.
3	*Acmella calva*	Asteraceae	Lato ghans	Herb	Flower	L	Godawari	1500	P	Forest			Aug.-Nov.
4	*Ageratum conyzoides*	Asteraceae	Gane	Herb	Leaf	M	Palung	1800	R	Fallow			May-Jun.
5	*Allium stracheyi*	Alliaceae	Jangali lasun	Herb	Leaf	D	Kalinchok	3900	R	Shrub land	R homeg.	P market	Aug.-Oct.
6	*Allium wallichii*	Alliaceae	Dundu sag	Herb	Leaf	R	Langtang	2600	R	Shrub land		U market	Aug.-Oct.
7	*Alternanthera sessilis*	Amaranthaceae	Saranchi sag	Herb	Leaf	L	Patan	1300	U	Fallow			May-Jul.
8	*Amaranthus caudatus*	Amaranthaceae	Latte sag	Herb	Leaf	L	Patan	1300	U	Fallow	Field	U market	Apr.-Jul.
9	*Amaranthus lividus*	Amaranthaceae	Lude sag	Herb	Leaf	L	Patan	1300	U	Fallow	Field	U market	Apr.-Jul.
10	*Amaranthus spinosus*	Amaranthaceae	Ban lunde	Herb	Leaf	L	Patan	1300	U	Fallow			Apr.-Jul.
11	*Amaranthus viridis*	Amaranthaceae	Lude sag	Herb	Leaf	L	Patan	1300	U	Fallow	Field	U market	Apr.-Jul.
12	*Anagallis arvensis*	Primulaceae	Armale	Herb	Leaf	L	Godawari	1500	P	Field (wild)			Dec.-Mar.
13	*Arisaema consanguineum*	Araceae	Raksya banko	Herb	Shoot	S	Munjo	2800	R	Forest			Apr.-May
14	*Arisaema flavum*	Araceae	Timchu	Herb	Shoot	M	Daman	2300	R	Forest			May-June
15	*Arisaema jacquemontii*	Araceae	Sarpa komaka	Herb	Root/tuber	S	Munjo	2800	R	Forest			May-June
16	*Arisaema tortuosum*	Araceae	Banko	Herb	Root/tuber	L	Godawari	1500	P	Forest			Jun.-Jul.
17	*Arisaema utile*	Araceae	Dhokaya	Herb	Shoot	M	Palung	1800	R	Forest			Jun.-Jul.
18	*Artocarpus heterophyllus*	Moraceae	Katahar	Tree	Fruit	M	Hetauda	500	U		U homeg.	U+P market	Apr.-Jun.
19	*Asparagus filicinus*	Asparagaceae	Ban kurilo	Herb	Shoot	L	Phulchoki	1800	R	Forest			May-June
20	*Asparagus racemosus*	Asparagaceae	Kurilo	Herb	Shoot	M	Palung	1800	R	Forest			April-June
21	*Basella alba*	Basellaceae	Poi sag	Herb	Leaf	M	Hetauda	500	U	Fallow			Jun.-Jul.
22	*Bassia latifolia*	Sapotaceae	Mahuwa	Tree	Flower	M	Manohari	200	R	Forest			Mar.-Apr.
23	*Bauhinia malabarica*	Fabaceae		Tree	Flower	M	Hetauda	500	U		U homeg.		Aug.-Sept.
24	*Bauhinia purpurea*	Fabaceae	Tanki	Tree	Flower	L	Godawari	1500	P		P homeg.		Aug.-Oct.
25	*Bauhinia vahlii*	Fabaceae	Bhorla	Climber	Fruit	M	Hetauda	500	U	Forest		U market	Aug.-Sept.
26	*Bauhinia variegata*	Fabaceae	Koiralo	Tree	Flower	L	Godawari	1500	P		U+P homeg.	U+P market	Apr.-May
27	*Bidens biternata*	Asteraceae	Kuro	Herb	Shoot	L	Phulchoki	1800	R	Fallow			May-Jun.
28	*Bidens pilosa*	Asteraceae	Kuro	Herb	Shoot	L	Bisankhu	1400	R	Fallow			May-Jun.
29	*Blumea lacera*	Asteraceae	Khicha bhwatha	Herb	Leaf	L	Bisankhu	1400	R	Fallow			May-Jun.
30	*Boerhavia diffusa*	Nyctaginaceae	Punarva	Herb	Leaf	M	Hetauda	500	U	Fallow			Jun.-Jul.
31	*Bombax ceiba*	Bombacaceae	Simal	Tree	Flower	M	Hetauda	500	U		U homeg.	U+P market	Feb.-Mar.
32	*Botrychium lanuginosum*	Ophioglossaceae	Jaluko	Herb	Shoot	R	Dhunche	2100	R	Forest			May-Jun.
33	*Caltha palustris*	Ranunculaceae		Herb	Leaf	R	Near Gos.	4200	R	Fallow			Aug.-Sept.
34	*Capparis spinosa*	Capparaceae	Bagh mukhwa	Shrub	Fruit	M	Hetauda	500	U	Forest			Nov.-Dec.

				Morpho-	Used	Collection site		Alti-	Urb.	Type nat.	Type agro-	Market	Season of
	Scientific plant name	Family	Local name	logy	plant part	Di.	Location	tude	lev.	vegetation	ecosystem	availability	availability
35	*Capsella bursa-pastoris*	Brassicaceae	Tori ghans	Herb	Leaf	L	Gowadari	1500	P	Fallow			Jan.-Apr.
36	*Caragana brevispina*	Fabaceae		Shrub	Flower	R	Langtang	3600	R	Fallow			Aug.-Sept.
37	*Cardamine scutata*	Brassicaceae	Chamsure ghans	Herb	Leaf	L	Godawari	1500	P	Shrub land			Feb.-Mar.
38	*Cassia tora*	Fabaceae	Chakramandi	Herb	Leaf	M	Manohari	200	R	Fallow			July-Aug.
39	*Cautleya spicata*	Zingiberaceae	Sano saro	Herb	Stem	L	Phulchoki	1800	R	Forest			May-Jun.
40	*Centella asiatica*	Apiaceae	Ghodtapre	Herb	Leaf	L	Godawari	1500	P	Shrub land			Feb.-Apr.
41	*Chenopodium album*	Chenopodiaceae	Bethe	Herb	Leaf	L	Bisankhu	1400	R	Field (wild)	Field	U market	Jan.-Mar.
42	*Chenopodium ambrosioides*	Chenopodiaceae	Rato latte	Herb	Leaf	L	Godawari	1500	P	Fallow			Aug.-Sept.
43	*Chenopodium murale*	Chenopodiaceae	Kalo bethe	Herb	Leaf	D	Charikot	1800	P	Field (wild)	Field	R+U market	Aug.-Oct.
44	*Chlorophytum nepalense*	Liliaceae	Ban pyaj	Herb	Leaf	L	Phulchoki	2000	R	Forest			Aug.-Sept.
45	*Cirsium wallichii*	Asteraceae	Thakal	Herb	Stem	L	Godawari	1500	P	Fallow			Jun-Jul.
46	*Clematis acuminata*	Ranunculaceae	Junge lahara	Climber	Shoot	R	Dhunche	2100	R	Forest			Jul.-Aug.
47	*Clematis buchananiana*	Ranunculaceae	Junge lahara	Climber	Shoot	R	Chandan.	2100	R	Forest			Aug.-Sept.
48	*Cleome viscosa*	Capparaceae	Swibhama	Herb	Leaf	M	Hetauda	500	U	Fallow			Aug.-Sept.
49	*Clintonia udensis*	Liliaceae		Herb	Leaf	S	Debuche	3600	R	Forest			Mar.-Jun.
50	*Colocasia esculenta*	Araceae	Pidanlu/Karkal	Herb	Root/tuber	L	Patan	1300	U		U+P homeg.	U market	Aug.-Oct.
51	*Commelina benghalensis*	Commelinaceae	Ban kane	Herb	Root/tuber	M	Hetauda	500	U	Forest			Jun.-Jul.
52	*Commelina paludosa*	Commelinaceae	Kane sag	Herb	Root/tuber	M	Hetauda	500	U	Forest			Jun.-Jul.
53	*Corchorus acutangulus*	Tiliaceae	Nalu	Shrub	Leaf	M	Manohari	200	R	Shrub land			Jun.-Jul.
54	*Cortia depressa*	Apiaceae	Bhutkesh	Herb	Leaf	R	Near Gos.	4200	R	Shrub land			Jul-Aug.
55	*Costus speciosus*	Zingiberaceae	Betlauri	Herb	Shoot	L	Godawari	1500	P		P homeg.		Jun-Jul.
56	*Crateva religiosa*	Capparaceae	Sipligan	Tree	Shoot	L	Patan	1300	U		U homeg.	U market	Mar.-Apr.
57	*Crotalaria pallida*	Fabaceae	Chhinchhine swan	Herb	Flower	M	Hetauda	500	U			U market	May-Jun.
58	*Crotalaria spectabilis*	Fabaceae	Ban sanai	Herb	Flower	M	Hetauda	500	U	Fallow			Aug.-Nov..
59	*Crotalaria tetragona*	Fabaceae		Herb	Fruit	M	Hetauda	500	U	Fallow			Sept.-Oct.
60	*Deeringia amaranthoides*	Amaranthaceae		Herb	Leaf	M	Manohari	200	R	Shrub land			Jun.-Jul.
61	*Dendrocalamus hamiltonii*	Poaceae	Tama bans	Grass	Shoot	L	Patan	1300	U		U+P homeg.	U+P market	Year round
62	*Dendrocalamus strictus*	Poaceae	Tama bans	Grass	Shoot	M	Hetauda	500	U		U homeg.	U+P market	Year round
63	*Deparia boryana*	Dryopteridaceae	Kalo neuro	Herb	Leaf	L	Godawari	1500	P	Forest		U+P market	May-Jun.
64	*Dillenia indica*	Dilleniaceae	Panchphal	Tree	Fruit	M	Hetauda	500	U		U homeg.		Jan.-Feb.
65	*Dioscorea alata*	Dioscoreaceae	Ghar tarul	Climber	Root/tuber	L	Patan	1300	U		U homeg.	U+P market	Dec.-Feb.
66	*Dioscorea bulbifera*	Dioscoreaceae	Ban tarul	Climber	Root/tuber	L	Godawari	1500	P	Forest	P homeg.	U+P market	Dec.-Feb.
67	*Dioscorea deltoidea*	Dioscoreaceae	Tarul	Climber	Root/tuber	L	Godawari	1500	P		P homeg.	U+P market	Dec.-Feb.
68	*Dioscorea esculenta*	Dioscoreaceae	Tarul	Climber	Root/tuber	L	Patan	1300	U		U homeg.	U+P market	Dec.-Feb.
69	*Dioscorea pentaphylla*	Dioscoreaceae	Mithe tarul	Climber	Root/tuber	L	Godawari	1500	P		P homeg.	U+P market	Dec.-Feb.
70	*Diplazium esculentum*	Dryopteridaceae	Masino neuro	Herb	Leaf	L	Patan	1300	U			U+P market	May-Jul.
71	*Diplazium maximum*	Dryopteridaceae	Neuro	Herb	Leaf	L	Patan	1300	U			U market	May-Jul.
72	*Diplazium spectabile*	Dryopteridaceae	Neuro	Herb	Leaf	L	Phulchoki	2100	R	Forest		U market	May-Jul.

	Scientific plant name	Family	Local name	Morpho-logy	Used plant part	Collection site Di.	Location	Alti-tude	Urb. lev.	Type nat. vegetation	Type agro-ecosystem	Market availability	Season of availability
73	*Diplazium stoliczkae*	Dryopteridaceae	Neuro	Herb	Leaf	L	Patan	1300	U			U+P market	May-Jun.
74	*Disporum cantoniense*	Liliaceae	Sano kukur daino	Herb	Leaf	L	Phulchoki	1800	R	Forest			Jan-Mar.
75	*Drepanostachyum falcatum*	Poaceae	Nigalo	Grass	Shoot	L	Hetauda	500	U		U homeg.	U+P market	April-June
76	*Drymaria cordata*	Caryophyllaceae	Abhijalo	Herb	Leaf	L	Bisankhu	1400	R	Forest			May-Jun.
77	*Dryopteris cochleata*	Dryopteridaceae	Danthe neuro	Herb	Leaf	M	Hetauda	500	U	Forest		U market	Mar.-May
78	*Eclipta prostrata*	Asteraceae	Bhringraj	Herb	Leaf	L	Patan	1300	U	Field (wild)	Field	U market	Jun.-Jul.
79	*Edgaria darjeelingensis*	Cucurbitaceae	Chathil	Climber	Fruit	R	Langtang	3600	R	Forest			Aug.-Sept.
80	*Elatostema platyphyllum*	Urticaceae	Sano gangleto	Herb	Leaf	L	Godawari	1500	P	Forest			May-Jun.
81	*Elatostema sessile*	Urticaceae		Herb	Leaf	L	Godawari	1500	P	Forest			May-Jun.
82	*Emilia sonchifolia*	Asteraceae	Tori phool	Herb	Leaf	M	Manohari	200	R	Fallow			Jul.-Aug.
83	*Eryngium foetidum*	Apiaceae	Brameli dhaniya	Herb	Leaf	D	Charikot	1800	P		R+P homeg.	P market	Aug.-Sept.
84	*Erysimum hieracifolium*	Brassicaceae		Herb	Leaf	R	Langtang	3600	R	Fallow			Jun.-Jul.
85	*Euphorbia hirta*	Euphorbiaceae	Dudhe ghans	Herb	Leaf	L	Bisankhu	1400	R	Fallow			May-Jun.
86	*Fagopyrum dibotrys*	Polygonaceae	Ban phaper	Herb	Leaf	L	Patan	1300	U			U market	May-Jun.
87	*Fagopyrum esculentum*	Polygonaceae	Mithe phaper	Herb	Leaf	L	Patan	1300	U		Field	U market	May-Jun.
88	*Fagopyrum tataricum*	Polygonaceae	Tite phaper	Herb	Leaf	L	Patan	1300	U		Field	U market	May-Jun.
89	*Ficus auriculata*	Moraceae	Timila	Tree	Fruit	L	Godawari	1500	P		P homeg.		Jan.-Mar.
90	*Ficus hispida*	Moraceae	Khasreto	Tree	Fruit	M	Hetauda	500	U	Forest			Jul.-Aug.
91	*Ficus lacor*	Moraceae	Kavro	Tree	Leaf	M	Manohari	200	R	Forest			May-Jun.
92	*Girardinia diversifolia*	Urticaceae	Lekali sisnu	Herb	Leaf	D	Near Kuri	2300	R	Shrub land			Jun.-Aug.
93	*Holarrhena pubescens*	Apocynaceae	Indrajau	Shrub	Leaf	M	Hetauda	500	U	Forest			May-Jun.
94	*Houttuynia cordata*	Saururaceae	Gane	Herb	Shoot	L	Godawari	1500	P	Forest			May-Jun
95	*Impatiens bicornuta*	Balsaminaceae		Herb	Shoot	M	Palung	1800	R	Forest			Aug.-Sept.
96	*Indigofera hebepetala*	Fabaceae	Masino sakhino	Shrub	Fruit	R	Dhunche	2100	R	Forest			Aug.-Sept.
97	*Indigofera pulchella*	Fabaceae	Sakhino	Shrub	Fruit	L	Phulchoki	1800	R	Forest			Sept.-Dec.
98	*Ipomoea alba*	Convolvulaceae	Chandra kali	Herb	Flower	M	Hetauda	500	U	Fallow			May-Jun.
99	*Ipomoea aquatica*	Convolvulaceae	Kalmi sag	Herb	Leaf	M	Hetauda	500	U	Fallow		U market	Feb.-Jul.
100	*Justicia adhatoda*	Acanthaceae	Asuro	Shrub	Leaf	L	Godawari	1500	P	Shrub land			Jan-Feb.
101	*Lathyrus aphaca*	Fabaceae	Bahabulaba	Herb	Leaf	L	Patan	1300	U	Fallow			Mar.-Apr.
102	*Launaea asplenifolia*	Asteraceae	Dudhe jhar	Herb	Leaf	M	Hetauda	500	U	Fallow			Jun.-Jul.
103	*Lecanthus peduncularis*	Urticaceae	Khole jhar	Herb	Leaf	L	Godawari	1500	P	Forest			May-Jun.
104	*Leucas cephalotes*	Lamiaceae	Guma	Herb	Leaf	M	Hetauda	500	U	Shrub land			Mar.-Jun.
105	*Lilium nepalense*	Liliaceae	Ban Lasun	Herb	Leaf	L	Phulchoki	1800	R	Forest			Mar.-Apr.
106	*Lygodium japonicum*	Schizaeaceae	Janai lahara	Climber	Leaf	M	Manohari	200	R	Forest			May-Jun.
107	*Macropanax dispermus*	Araliaceae	Chiniya	Tree	Shoot	L	Phulchoki	1800	R	Forest		U market	Mar.-May
108	*Malva verticillata*	Malvaceae	Laphe sag	Herb	Leaf	M	Hetauda	500	U			U+P market	May-Jun.
109	*Manihot esculenta*	Euphorbiaceae	Simal tarul	Shrub	Root/tuber	M	Hetauda	500	U		U homeg.	U market	Dec.-Feb.
110	*Medicago falcata*	Fabaceae	Bhirin sag	Herb	Leaf	M	Hetauda	500	U	Fallow			Sept.-Dec.

	Scientific plant name	Family	Local name	Morpho-logy	Used plant part	Collection site Di.	Collection site Location	Alti-tude	Urb. lev.	Type nat. vegetation	Type agro-ecosystem	Market availability	Season of availability
111	*Moringa oleifera*	Moringaceae	Sajiwan	Tree	Fruit	M	Hetauda	500	U		U homeg.	U+P market	Apr.-May
112	*Mucuna pruriens*	Fabaceae	Kauso	Climber	Fruit	L	Patan	1300	U		U homeg.	U market	Mar.-Apr.
113	*Natsiatum herpeticum*	Icacinaceae	Kali lahara	Herb	Leaf	M	Manohari	200	R	Fallow			May-Jun.
114	*Oenanthe javanica*	Apiaceae		Herb	Leaf	L	Godawari	1500	P	Forest			May-Jun.
115	*Oenanthe linearis*	Apiaceae	Khaki baku	Herb	Leaf	L	Godawari	1500	P	Forest			May-Jun.
116	*Ophioglossum nudicaule*	Ophioglossaceae	Jibre sag	Herb	Leaf	R	Dhunche	1800	R	Fallow			Mar.-Apr.
117	*Ophioglossum reticulatum*	Ophioglossaceae	Jibre sag	Herb	Leaf	D	Charikot	1800	P	Fallow			Mar.-Apr.
118	*Oreocnide frutescens*	Urticaceae		Herb	Leaf	R	Near Kuri	2000	R	Forest			Aug.-Sept.
119	*Oroxylum indicum*	Bignoniaceae	Tatelo	Tree	Fruit	M	Hetauda	500	U	Forest			Mar.-May
120	*Osmunda claytoniana*	Osmundaceae		Herb	Leaf	R	Dhunche	2100	R	Forest			May-Jun.
121	*Peperomia pellucida*	Piperaceae	Lata pate	Herb	Leaf	M	Manohari	200	R	Forest			Jul.-Aug.
122	*Persicaria microcephala*	Polygonaceae	Ban pire	Herb	Leaf	L	Godawari	1500	P	Forest			Apr.-May
123	*Persicaria nepalensis*	Polygonaceae	Priya ghans	Herb	Leaf	L	Godawari	1500	P	Forest			May-Jun.
124	*Persicaria perfoliata*	Polygonaceae	Ghumauro kanda	Climber	Leaf	L	Patan	1300	U	Fallow			May-Jun.
125	*Persicaria runcinata*	Polygonaceae		Herb	Leaf	R	Dhunche	2100	R	Forest			Jul.-Aug.
126	*Phlogacanthus thyrsiformis*	Acanthaceae		Shrub	Leaf	M	Hetauda	500	U	Forest			Mar.-May
127	*Phoenix acaulis*	Arecaceae		Tree	Fruit	M	Hetauda	500	U		U homeg.		Jun.-Jul.
128	*Phytolacca acinosa*	Phytolaccaceae	Jaringo sag	Herb	Leaf	S	Ghat	2500	R	Forest		U market	May-Jun
129	*Pilea symmeria*	Urticaceae		Herb	Leaf	L	Godawari	1515	P				May-Jun.
130	*Pilea umbrosa*	Urticaceae	Nil danthe	Herb	Leaf	L	Godawari	1515	P				May-Jun.
131	*Piptanthus nepalensis*	Fabaceae	Suga phool	Shrub	Flower	S	Namche	3400	R		R homeg.		Apr.-May
132	*Pithecellobium dulce*	Fabaceae	Jalebi	Shrub	Fruit	M	Hetauda	500	U	Forest			May-Jun.
133	*Plantago erosa*	Plantaginaceae	Isapgol	Herb	Leaf	L	Godawari	1515	P	Fallow			Jan.-Feb.
134	*Plantago lanceolata*	Plantaginaceae		Herb	Leaf	M	Daman	2300	R	Fallow			Jan.-Feb.
135	*Pleurospermum angelicoides*	Apiaceae		Herb	Leaf	S	Ghat	2500	R	Fallow			Jul.-Aug.
136	*Pleurospermum apiolens*	Apiaceae		Herb	Leaf	R	Langtang	3600	R	Fallow			Aug.-Sept.
137	*Polygonatum cirrhifolium*	Liliaceae		Herb	Leaf	R	Langtang	3600	R	Forest			Aug.-Sept.
138	*Polygonatum verticillatum*	Liliaceae	Khinraula	Herb	Leaf	S	Debuche	3600	R	Forest			May-Jun.
139	*Polygonum molle*	Polygonaceae	Thotne	Herb	Shoot	L	Godawari	1500	P		P homeg.	U market	Feb.-Apr.
140	*Polygonum plebeium*	Polygonaceae	Baluni sag	Herb	Leaf	L	Patan	1300	U	Fallow			Year round
141	*Polystichum squarrosum*	Dryopteridaceae	Phusre neuro	Herb	Shoot	L	Godawari	1500	P	Forest		U market	May-Jun.
142	*Portulaca oleracea*	Portulacaceae	Nundhiki	Herb	Shoot	L	Patan	1300	U	Fallow			Year round
143	*Pouzolzia sanguinea*	Urticaceae		Herb	Leaf	R	Dhunche	2100	R	Fallow			Jul.-Aug.
144	*Pteridium aquilinum*	Dennstaedtiaceae		Herb	Shoot	L	Bisankhu	1300	R	Forest			Jul-Jul
145	*Ranunculus diffusus*	Ranunculaceae	Nakore	Herb	Leaf	L	Godawari	1500	P	Fallow			Jan-Feb
146	*Ranunculus sceleratus*	Ranunculaceae		Herb	Leaf	L	Godawari	1500	P	Fallow			Year round
147	*Remusatia pumila*	Araceae		Herb	Leaf	S	Ghat	2500	R	Forest			May-Jun
148	*Rheum australe*	Polygonaceae	Padamchal	Herb	Leaf	D	Kalinchok	3900	R	Shrub land	R homeg		May-Aug

				Morpho-	Used	Collection site		Alti-	Urb.	Type nat.	Type agro-	Market	Season of
	Scientific plant name	Family	Local name	logy	plant part	Di.	Location	tude	lev.	vegetation	ecosystem	availability	availability
149	*Rhododendron arboreum*	Ericaceae	Laligurans	Tree	Flower	L	Godawari	1500	P	Forest			Feb-Apr
150	*Rorripa indica*	Brassicaceae	Pahelo jhar	Herb	Leaf	L	Patan	1300	U	Forest			Feb-May
151	*Rorripa nasturtium*	Brassicaceae	Sim sag	Herb	Leaf	L	Godawari	1500	P	Forest	Field	U market	Year round
152	*Rumex acetosa*	Polygonaceae	Amile ghans	Herb	Leaf	R	Near Gos.	2000	R	Forest			Aug-Sept
153	*Rumex dentatus*	Polygonaceae		Herb	Leaf	M	Palung	1800	R	Forest			Jul-Aug
154	*Rumex hastatus*	Polygonaceae	Charemala	Herb	Leaf	M	Hetauda	500	U	Forest			Feb-Mar
155	*Rumex nepalensis*	Polygonaceae	Halhale	Herb	Leaf	L	Godawari	1500	P	Fallow			Aug-Sept
156	*Rumex vesicarius*	Polygonaceae	Bhote palunge	Herb	Leaf	R	Near Gos.	2000	R	Fallow			May-Jun
157	*Sagittaria sagittifolia*	Alismataceae		Herb	Leaf	M	Hetauda	500	U	Fallow			Jul-Aug
158	*Sambucus adnata*	Caprifoliaceae		Shrub	Shoot	S	Munjo	2800	R	Forest			May-Jun
159	*Smilax aspera*	Smilacaceae	Kukurdiano	Climber	Shoot	L	Godawari	1500	P	Forest			May-Jun
160	*Smilax ferox*	Smilacaceae	Kukurdaino	Climber	Shoot	L	Godawari	1500	P	Forest			May-Jun
161	*Smilax lanceifolia*	Smilacaceae	Chhatiwan	Climber	Shoot	L	Godawari	1500	P	Forest			May-Jun
162	*Smilax ovalifolia*	Smilacaceae	Kukurdiano	Climber	Shoot	M	Daman	2100	R	Forest			May-Jun
163	*Smilax perfoliata*	Smilacaceae	Kukurdiano	Climber	Shoot	L	Phulchoki	1800	R	Forest			May-Jun
164	*Smilax rigida*	Smilacaceae		Climber	Shoot	M	Chandan	1800	R	Forest			May-Jun
165	*Solanum nigrum*	Solanaceae	Kalo bihi	Herb	Leaf	L	Godawari	1500	P	Fallow			May-Jun
166	*Solanum torvum*	Solanaceae	Thulo bihi	Herb	Fruit	M	Hetauda	500	U	Fallow			Aug-Oct
167	*Solena heterophylla*	Cucurbitaceae	Golkankri	Herb	Fruit	L	Godawari	1500	P	Forest			Jul-Aug
168	*Sonchus oleraceus*	Asteraceae	Dudhi kanda	Herb	Leaf	L	Patan	1300	U	Fallow			May-Jun
169	*Sonchus wightianus*	Asteraceae		Herb	Leaf	L	Patan	1300	U	Fallow			Jul-Aug
170	*Spermadictyon suaveolens*	Rubiaceae	Ban champa	Shrub	Shoot	L	Bisankhu	1400	R	Forest			Aug-Sept
171	*Stellaria monosperma*	Caryophyllaceae	Jethimadhu	Herb	Leaf	L	Godawari	1500	P	Forest			May-Jun
172	*Tamilnadia uliginosa*	Rubiaceae	Pidar/Maidal	Shrub	Fruit	M	Hetauda	500	U	Shrub land			Sept-Oct
173	*Tectaria macrodonta*	Dryopteridaceae	Kalo neuro	Herb	Shoot	L	Godawari	1500	P	Forest		U market	Jun-Jul
174	*Thamonocalamus aristatus*	Poaceae	Ban nigalo	Grass	Shoot	M	Manohari	200	R	Forest		U market	Mar-May
175	*Thelypteris multilineata*	Thelypteridaceae	Koche	Herb	Shoot	L	Phulchoki	2100	R	Forest			Jun-Jul
176	*Trianthema portulacastrum*	Aizoaceae	Gadapuraina	Herb	Shoot	M	Hetauda	500	U	Fallow			Apr-May
177	*Urtica dioica*	Urticaceae	Sisnu	Herb	Leaf	L	Bisankhu	1400	R	Fallow		U market	Year round
178	*Vicia angustifolia*	Fabaceae	Kutilkosa	Herb	Fruit	L	Hetauda	500	U	Fallow			Mar-Apri
179	*Vicia hirsuta*	Fabaceae	Kutilkosa	Herb	Fruit	L	Manohari	200	R	Fallow			Jun-Jul
180	*Woodwardia biserrata*	Blechnaceae		Herb	Stem	L	Godawari	1500	P	Forest			Jun-Jul
181	Unidentified a)	Araceae	Dudhe pidalu	Herb	Root/tuber				X		P homeg	U market	Jan-Mar
182	Unidentified b)	Araceae	Hathi paile pidalu	Herb	Root/tuber				X		P homeg	U market	Jan-Mar
183	Unidentified c)	Araceae	Khari pidalu	Herb	Root/tuber				X		P homeg	U market	Jan-Mar
184	Unidentified d)	Araceae	Panchmukhi pidalu	Herb	Root/tuber				X			U market	Jan-Mar

Note: X=Not determined; Homeg=Homegarden